

# HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

---

**Hatchery Program:**

Soos Creek Fall Chinook  
Fingerling Program

**Species or  
Hatchery Stock:**

Fall Chinook (*Onchorynchus tshawytscha*)  
Green River

**Agency/Operator:**

Washington Department of Fish and Wildlife

**Watershed and Region:**

Green River  
Puget Sound

**Date Submitted:**

, 2002

**Date Last Updated:**

August 21, 2002

## **SECTION 1. GENERAL PROGRAM DESCRIPTION**

### **1.1) Name of hatchery or program.**

Soos Creek Fingerling Chinook Program.

### **1.2) Species and population (or stock) under propagation, and ESA status.**

Green River Fall Chinook

### **1.3) Responsible organization and individuals**

**Name (and title):** Chuck Johnson, Operations Manager  
Brody Antipa, Complex Manager  
**Agency or Tribe:** Washington Department of Fish and Wildlife  
**Address:** 600 Capitol Way North, Olympia, WA 98501-1091  
**Telephone:** (360) 902-2653 (253) 840-4790  
**Fax:** (360) 902-2943 (253) 840-4724  
**Email:** johnscwj@dfw.wa.gov antipbja@dfw.wa.gov

#### **Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:**

In addition to the WDFW on-station production, 600,000 eyed-eggs are transferred to the Muckleshoot Tribe at the Keta Creek Hatchery, and approximately 2,000 eyed eggs are given to local school groups.

### **1.4) Funding source, staffing level, and annual hatchery program operational costs.**

Funding is provided through the State General Fund and Aquatic Lands Enhancement Account (Seattle Aquarium).

### **1.5) Location(s) of hatchery and associated facilities.**

Soos Creek Hatchery: Big Soos Creek (09.0072) RM 1, trib to the Green River (09.0001) at RM 33.5.

### **1.6) Type of program.**

Integrated Harvest.

### **1.7) Purpose (Goal) of program.**

## Augmentation

The Soos Creek Hatchery fall chinook fingerling program is used as a Double-Index Tag (DIT) group. Of the 3,200,000 released, 2,800,000 are mass marked (adipose-fin clip only), 200,000 adipose-fin clip/coded-wire tagged (Ad + CWT) and 200,000 coded-wire tagged only. The 2,800,000 mass marked can provide NOR/HOR ratio's on the spawning grounds in the Green River watershed. The DIT group can serve as an index group for wild fingerling fall chinook as well as providing data on catch contributions, run timing, total survival, migration patterns and straying into other watersheds.

### 1.8) Justification for the program.

This program will be operated to provide fish for harvest while minimizing adverse genetic, demographic or ecological effects on listed fish. This will be accomplished in the following manner:

- 1) Juvenile chinook will be released as smolts to minimize emigration time to saltwater thereby minimizing potential competition with and predation on natural-origin listed fish.
- 2) Juvenile chinook will be released after the usual wild chinook emigration time to minimize potential adverse interactions.
- 3) All juvenile chinook released will be acclimated at a hatchery facility capable of trapping the majority of returning adults. This practice will minimize straying and make possible the removal or regulation of hatchery fish allowed to spawn naturally.
- 4) All juvenile chinook will be marked to distinguish them from wild or naturally spawning chinook.
- 5) Adult chinook produced from this program will be harvested at a rate that allows adequate escapement of listed chinook .

### 1.9) List of program “Performance Standards”.

### 1.10) List of program “Performance Indicators”.

Performance Standards and Indicators for Puget Sound **Integrated Harvest** Chinook programs.

Performance Standard	Performance Indicator	Monitoring and Evaluation Plan
----------------------	-----------------------	--------------------------------

Produce adult fish for harvest	Survival and contribution rates	Monitor catch and measuring survivals by periodical CWT data.
Meet hatchery production goals	Number of juvenile fish released - <b>3,200,000</b> fingerlings	Estimating number of fish planted (weighing / counting fish), monitoring proximity to hatchery production goals, number released recorded on hatchery divisions "plant reports", data available on WDFW data base. Future Brood Documents.
Manage for adequate escapement	Hatchery and wild return rates	Monitoring hatchery/wild return rates through trapping (at the hatchery or at weir), redd and snorkel surveys on the spawning grounds plus catch records.

Minimize interactions with listed fish through proper broodstock management	Total number of broodstock collected - <b>3,500 adults</b>	Measuring number of fish actually spawned and killed to meet egg take goal at the hatchery. Hatchery Records.
	Sex ratios	Hatchery Records, Spawning guidelines
	Timing of adult collection/spawning - <b>early September to mid-October</b>	Start trapping prior to historical start of the run, continue trapping throughout the run, dates and times are recorded on hatchery divisions "adult reports", data available on WDFW data base.
	Number of listed fish passed upstream - <b>At Soos Creek: to be determined</b>	
	Hatchery stray rate	CWT data and spawning ground surveys
	Number wild fish used in broodstock - <b>See section 2.2.3</b>	Hatchery records
	Return timing of hatchery / wild adults - <b>early September to late October/late August to late October</b>	Hatchery records Hatchery records
	Adherence to spawning guidelines - <b>1:1 with the use of a backup male, if needed.</b>	Spawning guidelines

Minimize interactions with listed fish through proper rearing and release strategies	Juveniles released as smolts	Future Brood Document (FBD) and hatchery records
	Outmigration timing of listed fish / hatchery fish <b>May/May</b>	Hatchery records and historical natural out-migrant data
	Size and time of release <b>80 fpp/ May release</b>	FBD and hatchery records
Maintain stock integrity and genetic diversity	Effective population size	CWT data and mark / unmarked ratios of adults
	Hatchery-Origin Recruit spawners	Spawning guidelines
Maximize in-hatchery survival of broodstock and their progeny; and  Limit the impact of pathogens associated with hatchery stocks, on listed fish	Fish pathologists will monitor the health of hatchery stocks on a monthly basis and recommend preventative actions / strategies to maintain fish health	Spawning ground surveys
	Fish pathologists will diagnose fish health problems and minimize their impact	Co-Managers Disease Policy
	Vaccines will be administered when appropriate to protect fish health	Fish Health monitoring records

	A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings	
	Fish health staff will present workshops on fish health issues to provide continuing education to hatchery staff.	
Ensure hatchery operations comply with state and federal water quality standards through proper environmental monitoring	NPDES compliance	Monthly NPDES records

#### **1.11) Expected size of program.**

##### **1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).**

3,5000 adults

##### **1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.**

WDFW shall limit, as the management intent, annual production of fall chinook for on-station release at Soos Creek Hatchery to a total, maximum of 3,200,000 fingerlings. Limiting juvenile production to current (proposed) levels will help retain, and not forestall, potential future options for the recovery of the listed chinook ESU.

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling	Soos Creek (09.0072)	3,200,000
Yearling		

\* - 600,000 transferred to the Muckleshoot Tribe at Keta Creek facility.

#### **1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.**

For smolt-to-adult survival rate the goal is 1%. For broodyears 86 through 95 the range was .1 to 2.6% (Avg ~ .54%).

For brood years 1986 through 1993, the average adult return was 16,474 to harvest, 5,210 to hatchery rack and 1,779 to natural spawners (WDFW coded-wire tag data). Average smolt-to-adult return rate was 0.00433 to harvest, 0.00139 to rack and 0.00049 to natural spawners.

Fisheries in the terminal area are managed to achieve the 5,800 fish escapement goal for the natural (naturally produced (57%) and hatchery produced (43%), 1999 return year) component of the stock. Escapement levels back to the hatchery rack for broodyears 1995 through 2001 were 10,640, 13,464, 12,084, 9,313, 10,576, 5,967 and 11,751, respectively.

**1.13) Date program started (years in operation), or is expected to start.**

1901

**1.14) Expected duration of program.**

Ongoing.

**1.15) Watersheds targeted by program.**

Soos Creek (09.0072)

**1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.**

**SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.**

**2.1) List all ESA permits or authorizations in hand for the hatchery program.**

None.

**2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.**

**2.2.1) Description of ESA-listed salmonid population(s) affected by the program.**

**- Identify the ESA-listed population(s) that will be directly affected by the program.**

Duwamish/Green River/Summer-Fall Chinook



The mean age ratio of chinook carcasses sampled on Green River spawning grounds in return years 1988 through 1997 was 5.5% age 2, 19.1% age 3, 64.4% age 4, 10.9% age 5 and 0.1% age 6. The adult sex ratio of sampled carcasses in 1999 was 52% male and 48% female. At age 3, 4, 5 and 6, adults average 60 to 80 cm., 80 to 95 cm., 85 to 100 cm. and 95 to 105 cm., respectively.

Most naturally-spawned Green River chinook migrate to salt water after spending only a few months in freshwater. Arrival of both hatchery and naturally-produced smolts in the estuary peaks in May, and after a few weeks, most begin moving to nearshore feeding grounds in Puget Sound and the Pacific Ocean. Sexually mature fish begin arriving back at the river mouth as early as July. The upstream migration peaks in late August to mid-September. Spawning begins in early September, peaks in early October, and is generally complete by early November.

Adults spawn in the mainstem Green River from about RM 25.4 in Kent to the City of Tacoma diversion dam at RM 61. Approximately 70% of natural spawning occurs upriver from the mouth of Soos Creek (river mile 33.7). Tributary spawning occurs in the lower 4 miles of both Soos and Newaukum Creeks.

**- Identify the ESA-listed population(s) that may be incidentally affected by the program.**

Lower Skagit/MS Tribs Fall Chinook, Snohomish Summer and Fall Chinook, N. Lake Washington Tribs Summer/Fall Chinook, Issaquah Summer/Fall Chinook, Cedar River Summer/Fall Chinook and Puyallup Fall Chinook.

**2.2.2) Status of ESA-listed salmonid population(s) affected by the program.**

**- Describe the status of the listed natural population(s) relative to “critical” and “viable” population thresholds.**

Critical and viable population thresholds under ESA have not been determined, however, the SASSI report (WDFW) determined this population ( Duwamish/Green Summer/Fall Chinook) to be "healthy".

**- Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.**

On average (return years 1987-98), each Green River natural spawner produces 2.33 adults returning to Washington waters. (WDFW Chinook Run-reconstruction Tables)

**- Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.**

Escapements have exceeded the 5,800 fish goal in 9 of the past 12 years (1988-99), with a range of 2,476 to 11,512. The 12-year average escapement is 7,598. (WDFW RR Tables)

**- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.**

The ratio of Soos Creek hatchery-origin adults to mainstem Green River natural spawners averaged 33.4% in 7 years between 1989 and 1997 (WDFW coded-wire tag data). Small sample sizes (<4%) in 5 of these years, and the limited area sampled (river mile 33.8 to 41.4 only), make these data less than reliable when applied to the entire river.

The ratio of Soos Creek hatchery-origin adults to Newaukum Creek natural spawners averaged 23.3% in 9 years between 1989 and 1997 (WDFW coded-wire tag data). Sample rates averaged 30% per year.

**2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the "target area," and provide estimated annual levels of take**

**- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.**

Substantial numbers of apparently natural-origin chinook return to the Soos Creek hatchery in most years. Because they are not physically distinguishable from hatchery-origin fish, they are killed and used for broodstock in the approximate proportion that they are present in the rack return (39.4% average, 1990-1997; range 26% to 45%) until egg-take goals are met (WDFW coded-wire tag data). Approximately 1,400 listed fish per year will be taken. Some additional mortality will occur in the holding and handling process amounting to approximately 100 listed fish.

The Soos Creek Hatchery adult weir is capable of trapping 100% of the adult chinook returning to Soos Creek at creek mile .8. Up to 3,500 adults are passes upstream annually without regard to origin. The delay and handling of these fish may result in a low take risk to listed fish. Upstream of the hatchery weir is the hatchery pump intake which may cause a very low take risk to adults passing the intake dam. The pump intake screens are believed to pose a low level risk to juvenile migrants due to the small screen size and the high volume of bypass water associated with the structure. The weir and hatchery intake has been identified for improvements in the WDFW capital budget process.

There is an unknown level of competition and predation risk associated with fish released from the hatchery.

**- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.**

On average, 39.4% of the adult chinook returning to the Soos Creek hatchery are of natural origin (WDFW coded-wire tag data). Since 3,500 brood fish are needed to achieve the egg-take goal, between 780 and 1,380 natural-origin adults may be killed each year for spawning. In the past, surplus fish were often killed and sold, rather than be released above the rack into Soos Creek. It can be assumed that 39.4% of these fish were also of natural origin. Since the 1996 brood, it has been the practice to pass adults upstream to spawn naturally. Additional surplus fish are killed and sold for commercial processing or donated to food banks.

**Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).**

The total annual take at the Soos Creek Hatchery will be limited to returning adults. As the number of returning adults vary from year to year, so too will be the take of natural-origin adults. To meet minimum hatchery egg take needs it is necessary to "take" approximately 780 adults based on a 2,000 fish need (this is based on the assumption of 39.4% return of natural-origin fish X 1000 females and 1000 males returning.). Assuming a more natural sex ratio of about 30% females and 70% males, the minimum adult needs would be approximately 3,500 adults with a total take of about 1,380 natural origin fish.

In the past, surplus fish were often killed and sold, rather than be released above the rack into Soos Creek. It can be assumed that 39.4% of these fish were also of natural origin. Surplus adults were often passed upstream but there are no well defined goals for upstream escapement. The 1999 brood year upstream escapement was approximately 3,500 adults, which is probably in the upper range of what the Soos Creek Basin can support. There is a need to assess the natural carrying capacity of Soos Creek (Tom Cropp, personal communication 5/ 2000) If the mass marking program continues we will have a tool to identify adults of natural origin so they can be managed more effectively.

**- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.**

Prior to mass marking taking effect, if take levels are projected to be exceeded for both juveniles and adults, WDFW will consult with NMFS in timely manner.

### **SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES**

**3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review Report and Recommendations* - NPPC document 99-15). Explain any proposed deviations from the plan or policies.**

None.

**3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.**

WDF&W has signed an agreement with the Muckleshoot Tribe (see citations) linking mass marking with production goals. Production goals shall be maintained at 3.2 million, at a minimum, for agreement, from the Tribe, to mass mark for the next two years.

**3.3) Relationship to harvest objectives.**

**3.3.1) Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.**

Annual releases of fingerling chinook from the Soos Creek Hatchery contribute, on average, 15,529 age 2 and older fish to North American fisheries (WDFW coded-wire tag data from 1986 through 1994 releases). 67% are caught in Washington waters. Harvest rates average 63.1% for all fisheries and 41.3% for Washington fisheries (the allowable harvest level of hatchery-origin fish is set to achieve an escapement goal of 5,800 fish into the Green River watershed).

**3.4) Relationship to habitat protection and recovery strategies.**

Howard Hanson dam limits upper river salmonid production. The lower river basin is highly developed, channelized, diked and industrialized.

**3.5) Ecological interactions.**

Soos Creek fingerling chinook have a low probability of preying on/competing with listed fish (Risk Assessment, WDFW, 2000).

## **SECTION 4. WATER SOURCE**

**4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.**

Soos Creek Hatchery is supplied by surface water from Soos Creek. Water is withdrawn via 4 pumps at the hatchery site. Pumps produce 13,500 gallons per minute (gpm). In addition, a small spring water supply (50 gpm) can be utilized in the incubation building.

Soos Creek responds quickly to heavy rainfall and is prone to rapid fluctuations. Heavy bed loads are due to extensive watershed development. Winter floods are becoming an increasingly common occurrence due to continued watershed development.

**4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.**

The hatchery intake utilizes .125" x .125" mesh drum screens. Adult Chinook are normally passed upstream of the hatchery to spawn naturally above the hatchery intake. Hatchery effluent shall meet or exceed NPDES permit standards for discharge of pond cleaning waste or pond drawdown.

## **SECTION 5. FACILITIES**

**5.1) Broodstock collection facilities (or methods).**

Broodstock are collected in an in-stream trap situated in Soos Creek. The trap pond is the natural stream channel and measures approximately 150' x 200'. It is defined by a lower, semi-temporary weir, ladder, and "V" entry way and an upper semi-temporary weir.

**5.2) Fish transportation equipment (description of pen, tank truck, or container used).**

Does not apply.

**5.3) Broodstock holding and spawning facilities.**

Broodstock are held in the trap pond. Adults are seined, sorted, killed and spawned at pondside.

**5.4) Incubation facilities.**

Incubation utilizes 160 shallow troughs and 56 deep troughs.

**5.5) Rearing facilities.**

The facility utilize eight 10" X 80' raceways, eight 17.5' X 95' concrete rearing ponds and three .14 acre asphalt ponds

**5.6) Acclimation/release facilities.**

All station releases are from individual ponds into the creek. Most releases are forced releases of smolts in late May or early June.

**5.7) Describe operational difficulties or disasters that led to significant fish mortality.**

In the past 12 years:

1. Heavy debris loads cause the pump intake screens to become plugged frequently during flood events.
2. Flood risks limit the use of eight, low lying, standard rearing ponds as the flood waters often inundate them and allow the premature release of the fish.

**5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.**

The hatchery is equipped with a backup generator and adequate fuel supply in the event of a power outage. Two persons are on rotating standby status year around in the event of a problem. An upgraded alarm system is designed to detect changes in flow and power status. The risk of disease transmission shall be limited by using effective therapeutents, as prescribed, in a timely manner.

**SECTION 6. BROODSTOCK ORIGIN AND IDENTITY**

**Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.**

**6.1) Source.**

This stock originated from adults trapped in the Green River.

**6.2) Supporting information.**

**6.2.1) History.**

The Soos Creek Hatchery chinook originated from the Green River. Some additional stocks were occasionally imported in the early days of the hatchery operation but their contribution was not significant. The program has depended upon volunteer returns for many decades.

**6.2.2) Annual size.**

3,500 adults.

**6.2.3) Past and proposed level of natural fish in broodstock.**

On average, 39.4% of the adult chinook returning to the Soos Creek hatchery are of

natural origin (WDFW coded-wire tag data). Since 3,500 brood fish are needed to achieve the egg-take goal, between 780 and 1,380 natural-origin adults may be killed each year for spawning. With a permanent rack in place, all returning adults are captured. When the first 100% mass marked brood (1999 brood) returns in 2002 and '03 we will have the ability to by-pass adults of natural origin to spawn upstream of the hatchery.

**6.2.4) Genetic or ecological differences.**

None known.

**6.2.5) Reasons for choosing.**

Native stock.

**6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.**

At the present time we have no ability to distinguish between chinook of hatchery and natural origin. WDF&W has a two year agreement with the Muckleshoot Tribe to mass mark the 1999 and 2000 brood chinook released into the Green River.

**SECTION 7. BROODSTOCK COLLECTION**

**7.1) Life-history stage to be collected (adults, eggs, or juveniles).**

Adults.

**7.2) Collection or sampling design.**

Returning adults are trapped, volitionally, with an in-stream trap. Peak returns occur between early September and mid-October with the range from August to late October. If prescribed, adults are individually counted upstream, past the weir, to spawn naturally. Except when hand counted, adults normally have no access past the hatchery. Numerous adults stop short of entering the weir and spawn in the gravel bars downstream of the hatchery.

**7.3) Identity.**

See sections 6.3 and 7.2.

**7.4) Proposed number to be collected:**

**7.4.1) Program goal (assuming 1:1 sex ratio for adults):**

3,500 adults (1,750 males and 1,750 females).

**7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:**

Year	Adults Males	Females	Jacks	Eggs	Juveniles
1988	3700	3607	65	16,770,000	
1989	4800	4727	70	21,236,000	
1990	3600	3615	55	17,860,000	
1991	1800	1787	40	7,468,000	
1992	2200	2234	50	10,531,600	
1993	1300	1254	45	5,279,600	
1994	1900	1872	50	8,278,000	
1995	1766	1774	33	7,363,000	
1996	1532	1499	24	6,635,000	
1997	1499	1561	21	7,178,000	
1998	1099	992	8	4,876,700	
1999	1040	1024	4	4,805,000	
2000	952	885	7	4,664,800	
2001	994	982	7	4,722,000	

**7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.**

Unspawned adults are either donated to local food banks or sold to the carcass buyer for processing for human consumption or sent upstream to spawn naturally. In the past (97' & 98'), excess fish have been also passed upstream of the weir to spawn.

**7.6) Fish transportation and holding methods.**

Does not apply.

**7.7) Describe fish health maintenance and sanitation procedures applied.**

Standard fish health protocols, as defined in the Co-Manager Fish Health Manual (WDFW 1996), are adhered to.

**7.8) Disposition of carcasses.**

Spawned carcasses are utilized for nutrient enhancement or sold to a carcass buyer for



rendering into meal. Unspawned adults are either donated to local food banks or sold to the carcass buyer for processing for human consumption. Pond mortality is utilized for nutrient enhancement purposes.

**7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.**

Procedures set forth in the Co-Managers Fish Health Policy and the WDF&W spawning guidelines (Seidel, 1983) will be adhered to. Broodstock collected in future will be marked indicating hatchery origin.

## **SECTION 8. MATING**

**Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.**

**8.1) Selection method.**

Females are chosen randomly from ripe fish. Depending upon the magnitude of the returns, the aim is to spawn all ripe females each spawn day. Males are selected randomly. Matings are 1:1. About 1% of males used are "jacks". If female numbers exceed hatchery need, eggs are taken randomly from later spawning females, to represent that portion of the run, and the remaining females are "surplused", i. e., removed from the breeding pool.

**8.2) Males.**

Males are selected randomly. Matings are 1:1, but if a male killed for spawning is not fully ripe or has very little sperm, another male is used to assure fertilization of the eggs. About 1% of males used are "jacks".

**8.3) Fertilization.**

Matings are 1:1, but if a male killed for spawning is not fully ripe or has very little sperm, another male is used to assure fertilization of the eggs. The eggs from 1 female are collected in a bucket. The sperm from one male, or two, is expressed directly onto the eggs and mixed gently. The mix is allowed to sit for 30 to 60 seconds and then pooled in a common bucket with other eggs. They then go into the hatchery.

**8.4) Cryopreserved gametes.**

Not employed.

**8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.**

One to one matings will be utilized to maximize the number of spawners incorporated in the gene pool. Adults will be selected, randomly from the entire run. In the future, all matings will be from marked hatchery-origin adults.

## **SECTION 9. INCUBATION AND REARING -**

**Specify any management *goals* (e.g. “egg to smolt survival”) that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.**

### **9.1) Incubation:**

#### **9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.**

See 7.4.2 for eggs taken.

Green egg to fry survival: Average is 86.5%; Range is 82.7 to 89.7%

#### **9.1.2) Cause for, and disposition of surplus egg takes.**

On occasion, a surplus of eggs results from inaccurate green egg sampling at the time of egg take. Extra eggs are normally taken as a safeguard against potential incubation loss. Surplus fry, less than or equal to 10% are normally reared as part of the programmed releases. Additional excess was commonly released as unfed fry or short-term reared fry. In recent years, a greater emphasis has been placed on not exceeding the program release goals.

#### **9.1.3) Loading densities applied during incubation.**

Eggs are eyed in shallow troughs 20,000 to 25,000 per basket. Egg are hatched in deep troughs at about 26,000 per section.

#### **9.1.4) Incubation conditions.**

Eggs are hatched with Vexar substrate using ambient Soos Creek water. Water quality has deteriorated due to heavy silt load. Accumulated silt is flushed periodically from the trough sections.

#### **9.1.5) Ponding.**

Ponding occurs when the fry have achieved >95% button-up status. Ponding is forced and occurs between late December and mid-January.

#### **9.1.6) Fish health maintenance and monitoring.**

Egg fungus is controlled with a 15 minute formalin drip at 100 parts per million (ppm), 5 days per week, until the eggs are shocked and picked. Dead eggs are removed with the

aid of a "Jen-sorter" power egg picker. Coagulated yolk-sac incidence level is low.

**9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.**

A back-up generator is on-site to provide power for hatchery pumps in the event of power loss. Eggs in the future will be from marked hatchery-origin adults.

**9.2) Rearing:**

**9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available..**

Fry to smolt: Average is 95.4%; Range is 88.8 to 99.3%

**9.2.2) Density and loading criteria (goals and actual levels).**

Loading goals conform to guidelines set out in Fish Hatchery Management (Piper, 1982). Maximum loading goals, in terms of pounds per gallons per minute (lbs/gpm) at release, equates to 1.5 x fish length in inches. Maximum densities, in terms of lbs / cubic foot of rearing space, equates to .3 x fish length in inches.

**9.2.3) Fish rearing conditions**

All ponds receive ambient water from Soos Creek. Incoming oxygen levels are saturated, but are not normally monitored. Due to heavy silt loads the ponds are vacuumed frequently (weekly or as-needed). Normal loss is vacuumed to the pollution abatement pond. Losses derived from disease epizootics are sent to a sanitary landfill.

**9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.**

Not available.

**9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.**

Not available.

**9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).**

Feed type is a salmon formulation of dry crumbles or pellets. Feed brand varies with the contract price. Fish are fed daily at a rate approximating 2% B.W./day. The maximum feed rate goal is approximately .1 lb feed per gpm inflow. Feed conversions depend upon the diet and formulation, but range between .8 - 1.1: 1.

**9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.**

Ponds are vacuumed weekly or as-needed. Fish Health Specialists make scheduled visits to check on fish health. Medications or alternate management plans derive from these checks. When emptied, all ponds are cleaned, air dried and sun-sanitized, if possible.

**9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.**

Not applicable.

**9.2.9) Indicate the use of "natural" rearing methods as applied in the program.**

None available.

**9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.**

All fish, in the future, under propagation will be from marked hatchery-origin adults.

## **SECTION 10. RELEASE**

**Describe fish release levels, and release practices applied through the hatchery program.**

**10.1) Proposed fish release levels.**

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling	3,200,000	80	May	Soos Creek
Yearling				

**10.2) Specific location(s) of proposed release(s).**

**Stream, river, or watercourse:** Soos Creek (09.0072)  
**Release point:** Soos Creek, RM .8 (09.0072)  
**Major watershed:** Green River  
**Basin or Region:** Puget Sound

**10.3) Actual numbers and sizes of fish released by age class through the program.**

Release year	Eggs/ Unfed Fry	Avg size (fpp)	Fry	Avg size (fpp)	Fingerling	Avg size (fpp)	Yearling	Avg size
1988					11,706,195 251,406	289 22.5		
1989					9,862,026 360,500	149 29		
1990	4,749,000	1000			3,770,574	70		
1991			3,215,500	380	2,837,800	60		
1992					5,080,500	94		
1993					4,797,938	96		
1994					3,706,018	111		
1995	1,788,000	958	1,918,800	443	3,344,400	83		
1996	1,793,500	1000	50	500	3,189,200	62		
1997	1,459,200	1000	725,600	254	3,231,100	74		
1998	350,000	1000	303,066	365	3,802,861	72		
1999					3,532,100	82		
2000			414,800	321	3,096,413	77		
2001					3,395,665	77		
Average	844,917	992	1,096,302	377	4,122,793	91		

**10.4) Actual dates of release and description of release protocols.**

Most fish are forced released in mid to late May.

**10.5) Fish transportation procedures, if applicable.**

Not applicable.

**10.6) Acclimation procedures.**

Fish are reared their entire lifetime on Soos Creek water.

**10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.**

The Soos Creek Hatchery fall chinook fingerling program is used as a Double-Index Tag (DIT) group. Of the 3,200,000 released, 2,800,000 are mass marked (adipose-fin clip only), 200,000 adipose-fin clip/coded-wire tagged (Ad + CWT) and 200,000 coded-wire

tagged only. The 2,800,000 mass marked can provide NOR/HOR ratio's on the spawning grounds in the Green River watershed. The DIT group can serve as an index group for wild fingerling fall chinook as well as providing data on catch contributions, run timing, total survival, migration patterns and straying into other watersheds.

**10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.**

In the past, significant numbers of surplus fish were not reared full term but were planted as fry. In the future, egg takes will be carefully managed to minimize the likelihood of surplus eggs or fry.

**10.9) Fish health certification procedures applied pre-release.**

Routine fish health inspection by the Area Fish Health Specialist.

**10.10) Emergency release procedures in response to flooding or water system failure.**

Depending upon circumstances, release fish with either the highest probability of surviving to adulthood or the fish with the highest probability of sustaining catastrophic loss if held at the hatchery.

**10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.**

To minimize the risk of residualization and impact upon natural fish, hatchery fingerlings are released in late May or early June as fingerling (sub-yearling) smolts. All fish released are mass marked and DIT'd.

## **SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS**

**11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.**

Note: See section 1.10 for Monitoring and Evaluation. The purpose of a monitoring program is to identify and evaluate the benefits and risks which may derive from the hatchery program. The monitoring program is designed to answer questions of whether the hatchery is providing the benefits intended, while also minimizing or eliminating the risks inherent in the program. A key tool in any monitoring program is having a mechanism to identify each hatchery production group.

Each production group shall be identified with distinct otolith marks, adipose clips, coded wire tags, blank wire tags or other identification methods as they become available, to allow for evaluation of each particular rearing and/or release strategy. This will allow for selective harvest on hatchery stocks when appropriate, monitoring of interactions of

hatchery and wild fish wherever they co-mingle in riverine, estuarine and marine habitats and assessment of the status of the target population. WDFW shall monitor the Chinook salmon escapement into the target and non-target Chinook populations to estimate the number of tagged, un-tagged and marked fish escaping into the river each year and the stray rates of hatchery Chinook into the rivers.

**11.1.1) Describe plans and methods proposed to collect data necessary to respond to each “Performance Indicator” identified for the program.**

WDF&W mass mark and double-index tag all fingerlings released from the Soos Creek Hatchery to allow for evaluation of the fishery contribution, survival rates, migration patterns and straying levels to other Puget Sound watersheds. Also, to monitor the NOR/HOR spawning ground ratios.

**11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.**

Funding and resources are currently committed to monitor and evaluate this program as detailed in the Resource Management Plan for Puget Sound Chinook Salmon Hatcheries (Washington Department of Fish and Wildlife and Puget Sound Treaty Tribes, August 23, 2002).

**11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.**

Monitoring and evaluation will be undertaken in a manner which does not result in an unauthorized take of listed chinook.

## **SECTION 12. RESEARCH**

**12.1) Objective or purpose.**

None

**12.2) Cooperating and funding agencies.**

**12.3) Principle investigator or project supervisor and staff.**

**12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.**

**12.5) Techniques: include capture methods, drugs, samples collected, tags applied.**

**12.6) Dates or time period in which research activity occurs.**

**12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.**

**12.8) Expected type and effects of take and potential for injury or mortality.**

**12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached “take table” (Table 1).**

**12.10) Alternative methods to achieve project objectives.**

**12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.**

**12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.**

## **SECTION 13. ATTACHMENTS AND CITATIONS**

Cropp, Tom, Hage, Paul, 1999, Green River Chinook: Estimation of hatchery strays in the naturally spawning population, Washington Department of Fish and Wildlife, Olympia.

Piper, Robert, et. al., 1982, Fish Hatchery Management; United States Dept of Interior, Fish and Wildlife Service, Washington, DC.

Seidel, Paul, 1983, Spawning Guidelines for Washington Department of Fish and Wildlife Hatcheries, Washington Department of Fish and Wildlife, Olympia.

Washington Department of Fish and Wildlife. 1996. Fish Health Manual. Hatcheries Program, Fish Health Division, Washington Department of Fish and Wildlife, Olympia.

Washington Department of Fish and Wildlife, Muckleshoot Tribe, 4/4/00, Production and Mass Marking Agreement between the Muckleshoot Tribe and WDFW&W.

Washington Department of Fish and Wildlife and Puget Sound Treaty Tribes, 2002, “Puget Sound Chinook Salmon Hatcheries, Resource Management Plan”, a component of Comprehensive Chinook Salmon Management Plan, August 23, 2002. 103 pages.



**SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY**

“I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973.”

Name, Title, and Signature of Applicant:

Certified by \_\_\_\_\_ Date: \_\_\_\_\_

Table 1. Estimated listed salmonid take levels of by hatchery activity.

<b>Listed species affected: Chinook ESU/Population: Puget Sound Chinook Activity: Soos Creek Chinook Program</b>				
<b>Location of hatchery activity: Soos Creek Hatchery Dates of activity: August1-October 31 Hatchery program operator: WDFW</b>				
<b>Type of Take</b>	<b>Annual Take of Listed Fish By Life Stage (<i>Number of Fish</i>)</b>			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
<b>Observe or harass a)</b>				
<b>Collect for transport b)</b>				
<b>Capture, handle, and release c)</b>			up to 1,380**	
<b>Capture, handle, tag/mark/tissue sample, and release d)</b>				
<b>Removal (e.g. broodstock) e)</b>				
<b>Intentional lethal take f)</b>			up to 4,620*	
<b>Unintentional lethal take g)</b>	25 K - 42 K****	2.4 K 26 K****		
<b>Other Take (specify) h)</b>		Unknown ***		

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.

b. Take associated with weir or trapping operations where listed fish are captured and transported for release.

c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.

d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.

e. Listed fish removed from the wild and collected for use as broodstock.

f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.

g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.

h. Other takes not identified above as a category.

\* 39.4 % of entire number trapped (range 26% to 45%) are estimated to be of natural origin (Cropp, et. al. 1999). The range of natural broodstock killed may range from 780 to 1380 to meet minimum egg take needs. See section 2.2.3 Hatchery-origin plus natural-origin fish are often put upstream, in varying numbers, to spawn naturally. Varying numbers of excess adults are killed as surplus and sold or donated. These may contain up to 45% natural-origin fish. Total returns since 1988 brood have ranged from 3,656 to 13,414 adults (avg.is 8,670). Total wild chinook trapped is, at a maximum" approximately 45% of maximum likely return since 1988 (13,414 fish in '89) which is 6,000 adults (the sum of "c" and "f" above). See Section 2.2.3 for further detail.

- \*\* Upstream escapement goal approximately 3,500 fish.
- \*\*\* Unknown level of competition and predation risk associated with fish release.
- \*\*\*\* The potential mortality portion of total Soos Creek program which may be of wild-origin parents, bases on hatchery/wild ratios described in section 2.2.3.